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United States Department of the Interior
Fish and Wildlife Service

Fishery Leaflet 181

Chicago, 54, Ill. March 1946

FISH CAN BE STORED IN REFRIGERATED LOCKERS WITH OTHER FOODS

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On occasions when "off" odors develop in vegetables, dairy products and meats stored in freezers, the cause is generally attributed to fish located elsewhere in the room. Actually, the fish are seldom the source of these foreign odors. Many locker plant operators, homemakers and those who have need to provide low temperature storage for frozen foods are in doubt as to the advisability of storing frozen fish along with their other commodities. They are either fearful or uncertain as to the possibility of contaminating their produce with fishy odors and tastes.

While the locker industry is comparatively young, the larger frozen food industry, upon which it depends for information, is barely a few years its senior. These first few years in any industry are always years of pioneering, when many unforseen problems require solution. While the early users of lockers in the Middle West were discovering a need for protective packaging to prevent desiccation of their meats, the Northwest users were discovering that fruits likewise needed this protection. Gradually the people of the Middle West have learned that meats, particularly pork, had a maximum cold storage life, after which the fats became rancid, while the people of the Northwest have learned the need for blanching to prevent the development of off flavors in frozen vegetables.

Likewise dairy science has discovered that fish odors or flavors in butter may result from at least four sources other than fish. According to Sommers and Smit (1923), salt favors the development of fishy flavor in butter. Davies and Mattick (1928) report that a fishiness in dairy products has often resulted from the breakdown of lecithin, particularly in milks possessing metallic contamination. According to Davies (1936), milk and butter from cows fed generously on byproducts from the manufacture of beet sugar often develops a fishy flavor. More recently Davies (1941) reports that the growth of acid-producing molds will cause fishiness to develop in butter in storage before tallowiness sets in.

Before scientific and practical knowledge on the use of locker storage had been accumulated, operators and users alike believed off odors arose from some contaminating product. Since stale fish was known to possess disagreeable odors, it was assumed that all fish were malodorous, with the result that fresh seafoods were banned from many locker plants. When questioned on this subject of frozen fish storage, many operators would shrug and say, "No fish allowed", or "I do not

like to store fish because it might contaminate other products, especially butter", or, "I will not permit fish storage under any circumstances". However, a few operators did say, "Yes, you may, if it is properly prepared and packaged".

Confusion over the storage of fish led to a series of experiments which have been described by Harrison and Stansby (1940), in which butter was stored in the same locker with frozen fish and shellfish. Samples of 93 score butter, cut into approximately one inch cubes and wrapped in vegetable parchment (the customary wrap for butter) were stored along with packaged fish in each of four closed but unsealed gallon cans in the locker at +10° F. "Sole" or flounder was placed in the first can with the butter, oysters in the second, king salmon in the third and no fish in the last (control). The fillets of sole and the pieces of salmon, each weighing about 1/2 lb., were individually wrapped in moisture-vapor-proof paper of the cellulose derivative type. The oysters were packaged in heat-sealed moisture-vapor-proof bags.

A professional butter grader was employed to detect progressive changes in quality over a period of time. All butter samples scored 93 after one week, 92 after two weeks, and 91.5 after one month of storage with fish. After a period of 337 days the butter samples stored without fish (control) scored 91.0; those stored with sole scored 91.5; those with oysters, 91.5; and those with salmon, 89.0. These results are presented in table 1.

Thus the score of all butter samples stored for nearly a year with fish remained as high as the control samples, with the exception of that stored with salmon. Even this sample remained in the edible classification.

Butter was selected for storage with fish because it is a delicately-flavored fatty substance that will readily absorb foreign odors for subsequent detection. The fact that no absorption of odor was observed, as indicated by the scores, proves that properly packaged fish and seafoods can be successfully stored with other frozen commodities.

Table 1.--Change in quality of 93 score butter when stored in a refrigerated locker at +10° F. with packaged fish.

Storage of Samples	Average Score of Butter Stored			
	7 days	14 days	32 days	337 days
Butter without fish	93.0	92.0	91.5	91.0
Butter with sole	93.0	92.0	91.5	91.5
Butter with oysters	93.0	92.0	91.5	91.5
Butter with salmon	93.0	92.0	91.5	89.0

Only fresh fish properly packaged is recommended for locker storage. The locker operator should encourage the preparation of only high-quality products, for, in this way, the customers will obtain the more satisfactory storage of their products. Commercially frozen and packaged fish and seafood are usually of very good quality, therefore they are suited to locker storage.

In dressing fish at home or in the locker plant for refrigerated storage, it is recommended that the fish be cut in as large pieces as possible in order to minimize the amount of exposed surface. It is advisable to prepare pieces of fish of the size normally used for a meal, rather than to prepare individual steaks. The use of a wrapping paper which is adequately moisture-vapor-proof is mandatory if satisfactory storage is to be attained. Ordinary waxed or parchment papers are quite unsatisfactory, and special papers such as are manufactured for use with frozen foods must be employed. The product should be wrapped tightly in order to minimize the amount of enclosed air; furthermore, a generous overlap is necessary to seal the product from the surrounding atmosphere. Shellfish should be removed from their shells, cleaned, and packed in a weak brine solution (about 2 percent). Ordinary waxed cardboard cartons either of the ice cream or cylindrical type are unsatisfactory for storing shellfish. Better results are obtained by using glass jars provided with tight lids and sealed with jar rubbers or gasket compound. The products should be covered with the dilute brine solution and an air space of at least one ince provided to allow for expansion during freezing. No difficulty with the jars breaking during freezing will occur if this air space is provided, and the use of air tight jars greatly minimizes discoloration and "off" color development.

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